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December 30, 2020

Mr. Brian Conrath
Illinois Environmental Protection Agency
1021 N. Grand Avenue East
Springfield, IL 62702-4059

Subject: 2010300074 - Winnebago County
Source Area 7 Revised Discharge Limits
Southeast Rockford Groundwater Contamination Superfund Site
Rockford, Winnebago County, Illinois
Superfund/Technical

Dear Mr. Conrath:

CDM Smith Inc. (CDM Smith) is submitting two copies of this letter to document revised surface water discharge limits for the Southeast Rockford Groundwater Contamination Superfund (SE Rockford) site Source Area (Area 7) remedial action (RA) treatment system. The revised discharge limits were reviewed by the Illinois Environmental Protection Agency (Illinois EPA) Bureau of Water (BOW).

Surface water standards and criteria upon which discharge limits were based as initially identified in the Operable Unit 3 (OU3) ROD dated June 11, 2002 have changed since the ROD was issued. In addition, CDM Smith evaluated discharge limits based on different exposure scenarios and receptors to determine the most appropriate discharge limit for the circumstances that exist at Area 7.

As discussed in the ROD, discharge limits are based on Title 35 of the Illinois Administrative Code (35 IAC), Part 302, Water Quality Standards. Specific water quality standards that apply to all waters of the state are listed in 35 IAC 302.208. For substances that do not have a numeric standard listed in 35 IAC 302.208, procedures for developing water quality criteria based on toxicity are provided in 35 IAC 302, Subpart F. Using these procedures, Illinois EPA BOW has developed "derived criteria" for a number of different substances that do not have numeric standards.

Table 34 of the ROD (replicated in **Table 1** below) identifies the discharge limits based on both aquatic toxicity (acute and chronic) and human health-based criteria at the time of the ROD. As stated in the ROD, in most cases the acute criterion is used as the daily maximum quality-based limit. In some rare cases, a human-health-based limit may be used as the monthly average limit, depending on the potential for longer-term exposure. Discharge would be to a zero- or low-flow stream (i.e., storm ditch) and the water quality criteria would apply at the end of the pipe. As a

result of subsequent pre-design investigation activities after the ROD was issued, carbon tetrachloride was identified as a contaminant of interest for Area 7 (Illinois EPA 2004). Based on discussions with Illinois EPA BOW, the chronic aquatic life criterion of 0.28 mg/L was utilized as a discharge limit.

Table 1. Discharge Limits Identified in the 2002 ROD

Chemical	Aquatic Life Acute Criteria	Aquatic Life Chronic Criteria	Human Health Criteria
1,1-dichloroethylene	3,000 ug/L	240 ug/L	0.95 ug/L
1,2-dichloroethylene	14 mg/L	1.1 mg/L	n/a
ethylbenzene	210 ug/L	17 ug/L	9.3 mg/L
tetrachloroethylene	1.2 mg/L	0.15 mg/L	2.8 ug/L
toluene	2,000 ug/L	230 ug/L	62 mg/L
1,1,1-trichloroethane	4,900 ug/L	390 ug/L	n/a
1,1,2-trichloroethane	19 mg/L	4.4 mg/L	12 ug/L
trichloroethylene	12 mg/L	0.94 mg/L	25 ug/L
xylenes	0.92 mg/L	0.073 mg/L	62 mg/L

Notes:
Technology-based (BAT) limits are normally used for benzene (0.05 mg/L) and total BTEX (benzene, ethylbenzene, toluene, and xylenes) (0.75 mg/L).
The lowest criterion is shaded in grey.
mg/L = milligram per liter; ug/L = microgram per liter; n/a = no criterion available

Starting with the discharge limits listed in the 2007 final Source Area 4 leachate component design and followed by the subsequent Area 7 design, CDM Smith has conservatively used a combination of the lowest criterion from the aquatic and human health as indicated by the grey shading in Table 1.

Inspection of the most recent Illinois EPA water quality criteria reveals that several of the criteria identified in the ROD have been updated. The most recent Illinois EPA water quality criteria are provided in Title 35 of the Illinois Administrative Code, Subtitle C, Chapter I, Part 302 Water Quality Standards[1] (effective July 1, 2015) and the Illinois EPA Derived Water Quality Standards[2] (updated April 4, 2013). **Table 2** summarizes the current acute and chronic criteria for aquatic life and the human health-based criteria based on a general use scenario. In this table, if values have changed since the ROD, they are indicated in **bold** text. The direction of the change is indicated as ↑ if the current concentration is higher than the previous concentration and as ↓ if the current concentration is lower than the previous concentration. If the value is unchanged, no arrows are presented.

[1] https://www.epa.gov/sites/production/files/2019-11/documents/ilwqs-title35-part302.pdf
[2] https://www2.illinois.gov/epa/Documents/epa.state.il.us/water/water-quality-standards/water-quality-criteria-list.pdf

Table 2. Current (2020) Illinois EPA General Use Water Quality Criteria for Chemicals of Interest Identified in the ROD

Chemical	Aquatic Life Acute Criteria	Aquatic Life Chronic Criteria	Human Health Criteria
carbon tetrachloride	3.5 mg/L [b]	0.28 mg/L [b]	1.4 ug/L [b]
1,1-dichloroethylene	3,000 ug/L [b]	240 ug/L [b]	**↑ 120 ug/L** [b]
1,2-dichloroethylene	14 mg/L [b]	1.1 mg/L [b]	n/a [b]
ethylbenzene	**↓ 150 ug/L** [a]	**↓ 14 ug/L** [a]	**n/a** [c]
tetrachloroethylene	1.2 mg/L [b]	0.15 mg/L [b]	**n/a** [b]
toluene	2,000 ug/L [a]	**↑ 600 ug/L** [a]	**n/a** [c]
1,1,1-trichloroethane	4,900 ug/L [b]	390 ug/L [b]	n/a [b]
1,1,2-trichloroethane	19 mg/L [b]	4.4 mg/L [b]	12 ug/L [b]
trichloroethylene	12 mg/L [b]	0.94 mg/L [b]	**↑ 26 ug/L** [b]
xylenes	0.92 mg/L [a]	**↑ 0.36 mg/L** [a]	**n/a** [c]

Sources:
[a] Illinois EPA, Section 302.208 Numeric Standards for Chemical Constituents (https://pcb.illinois.gov/documents/dsweb/Get/Document-33354/)
[b] Illinois EPA Derived Water Quality Criteria (https://www2.illinois.gov/epa/Documents/epa.state.il.us/water/water-quality-standards/water-quality-criteria-list.pdf)
[c] This chemical was not included in Section 302.208 or the Derived Water Quality Criteria table; the basis of the values presented in the ROD is not known.

Note:
mg/L = milligram per liter; ug/L = microgram per liter; n/a = no criterion available

In addition, a number of additional organic chemicals, not previously identified in the ROD, have been detected in the treatment system influent or have been added to the list of as contaminants of interest as is the case with 1,4-dioxane. **Table 3** summarizes the current acute and chronic criteria for aquatic life and the human health-based criteria based on a general use scenario for these additional chemicals.

Table 3. Illinois EPA General Use Water Quality Criteria[a] for Additional Influent Chemicals

Chemical	Aquatic Life Acute Criteria	Aquatic Life Chronic Criteria	Human Health Criteria[b]
4-bromofluorobenzene	n/a	n/a	n/a
n-butylbenzene	(39 ug/L)	(3.1 ug/L)	n/a
sec-butylbenzene	(82 ug/L)	(6.6 ug/L)	n/a
chloroethane	(13 mg/L)	(1 mg/L)	n/a
dibromofluoromethane	n/a	n/a	n/a
1,1-dichloroethane	(20 mg/L)	(2 mg/L)	n/a
1,2-dichlorobenzene	210 ug/L	170 ug/L	n/a
1,2-dichloroethane	25 mg/L	4.5 mg/L	0.023 mg/L
1,4-dioxane	(440 mg/L) [c]	(36 mg/L) [c]	n/a [c]
isopropylbenzene	n/a	n/a	n/a
p-isopropyltoluene	(85 ug/L)	(6.8 ug/L)	n/a

Table 3. Illinois EPA General Use Water Quality Criteria[a] for Additional Influent Chemicals

Chemical	Aquatic Life Acute Criteria	Aquatic Life Chronic Criteria	Human Health Criteria[b]
4-methyl-2-pentanone	46 mg/L	1.4 mg/L	n/a
naphthalene	510 ug/L	68 ug/L	n/a
n-propylbenzene	(130 ug/L)	(10 ug/L)	n/a
styrene	2.5 mg/L	0.2 mg/L	n/a
trichlorofluoromethane	n/a	n/a	(250 mg/L)
1,2,4-trimethylbenzene	360 ug/L	29 ug/L	n/a
1,3,5-trimethylbenzene	(140 ug/L)	(11 ug/L)	n/a
vinyl chloride	22 mg/L	1.7 mg/L	2.0 ug/L

Sources:
[a] Illinois EPA Derived Water Quality Criteria (https://www2.illinois.gov/epa/Documents/epa.state.il.us/water/water-quality-standards/water-quality-criteria-list.pdf)
[b] Human health criteria have been calculated for many more substances than are listed in the derived criteria table; however, because the values are much higher than those for aquatic life, they are not presented in the table.
[c] Based on values for dioxane.

Notes:
Values enclosed by "( )" were not calculated according to the Illinois EPA regulations due to limited data, these values should only be used for advisory purposes such as establishing "reasonable potential".
mg/L = milligram per liter; ug/L = microgram per liter; n/a = no criterion available

As shown in **Tables 2 and 3**, the Illinois EPA guidance does not specify numeric standards for the protection of human health for several chemicals. Thus, CDM Smith also reviewed the U.S. Environmental Protection Agency (USEPA) national recommended water quality criteria for human health. Human health ambient water quality criteria represent specific levels of chemicals or conditions in a water body that are not expected to cause adverse effects to human health. USEPA provides human health criteria for the consumption of “water + organism” and “organism only” for states to consider when adopting criteria into their water quality standards. These human health criteria are developed by USEPA under Section 304(a) of the Clean Water Act. **Table 4** summarizes the USEPA human health national recommended water quality criteria (the current Illinois EPA human health criteria are also shown for reference).

Table 4. Current (2020) USEPA National Recommended Water Quality Criteria

Chemical	Illinois EPA Human Health Criteria	Water + Organism [a]	Organism Only [a]
Chemicals Identified in ROD			
carbon tetrachloride	1.4 ug/L	0.4 ug/L	5 ug/L
1,1-dichloroethylene	120 ug/L	300 ug/L	20,000 ug/L
1,2-dichloroethylene	n/a	100 ug/L (trans)	4,000 ug/L (trans)
ethylbenzene	n/a	68 ug/L	130 ug/L
tetrachloroethylene	n/a	10 ug/L	29 ug/L
toluene	n/a	57 ug/L	520 ug/L

Table 4. Current (2020) USEPA National Recommended Water Quality Criteria

Chemical	Illinois EPA Human Health Criteria	Water + Organism [a]	Organism Only [a]
1,1,1-trichloroethane	n/a	10,000 ug/L	200,000 ug/L
1,1,2-trichloroethane	12 ug/L	0.55 ug/L	8.9 ug/L
trichloroethylene	26 ug/L	0.6 ug/L	7 ug/L
xylenes	n/a	n/a	n/a
Additional Chemicals Identified in Treatment System Influent			
4-bromofluorobenzene	n/a	n/a	n/a
n-butylbenzene	n/a	n/a	n/a
sec-butylbenzene	n/a	n/a	n/a
chloroethane	n/a	n/a	n/a
dibromofluoromethane	n/a	n/a	n/a
1,1-dichloroethane	n/a	n/a	n/a
1,2-dichlorobenzene	n/a	1,000 ug/L	3,000 ug/L
1,2-dichloroethane	0.023 mg/L	9.9 ug/L	650 ug/L
1,4-dioxane	n/a	n/a	n/a
isopropylbenzene	n/a	n/a	n/a
p-isopropyltoluene	n/a	n/a	n/a
4-methyl-2-pentanone	n/a	n/a	n/a
naphthalene	n/a	n/a	n/a
n-propylbenzene	n/a	n/a	n/a
styrene	n/a	n/a	n/a
trichlorofluoromethane	250 mg/L	n/a	n/a
1,2,4-trimethylbenzene	n/a	n/a	n/a
1,3,5-trimethylbenzene	n/a	n/a	n/a
vinyl chloride	2.0 ug/L	0.022 ug/L	1.6 ug/L

Source:
[a] USEPA National Recommended Water Quality Criteria (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table)

Note:
ug/L = microgram per liter; ug/L = microgram per liter; n/a = no criterion available

As noted previously, one of the goals of this memorandum is to make recommendations as to the most appropriate criteria to use as discharge limits. These discharge limits would be applied to discharges from the treatment system at the end of the pipe before it enters the storm ditch. Because the storm ditch is not a source of drinking water, is not expected to be used for recreational purposes (e.g., wading, swimming), and is a zero- or low-flow stream that does not provide adequate aquatic habitat to be used for fishing, the human health criteria are not an appropriate basis for establishing discharge limits. Rather, focus should be on ensuring the aquatic life standards are met.

As stated in the ROD, the acute aquatic life criterion should be used as the daily maximum limit. However, use of the acute criterion may not be adequately protective of the chronic exposure

scenario that actually exists from the almost continual discharge of treated water to the storm ditch. Therefore, CDM Smith recommends use of the chronic aquatic life criterion as the basis of discharge limit for all compounds. Use of the chronic aquatic life criterion is further supported by Illinois EPA BOW's previous use of the chronic aquatic life criterion for carbon tetrachloride (Illinois EPA 2004) despite the fact that the human health criterion was lower (1.4 ug/L).

In applying the chronic aquatic life criterion, in accordance with Illinois EPA water quality guidance (per Section 302.208 subpart (b)), discharge concentrations "shall not be exceeded by the arithmetic average of at least four consecutive samples collected over any period of at least four days". However, a conservative approach would be to apply this criterion as a not-to-exceed limit. **Table 5** on the following page provides a comparative list of the aquatic life acute, aquatic life chronic, and human health criteria, with the recommended chronic criteria in shaded cells.

If you have any questions or comments, please contact me at (312) 780-7737.

Sincerely,

John C. Grabs, P.G., PMP
Senior Project Manager
CDM Smith, Inc.

cc: Terese Von Donsel, USEPA
Troy McFate, EnviroServe

Table 5. Southeast Rockford Area 7 Current Water Quality Criteria for All Chemicals of Interest

Chemical	Aquatic Life Acute Criteria	Aquatic Life Chronic Criteria	Human Health Criteria
carbon tetrachloride	3.5 mg/L	0.28 mg/L	1.4 ug/L
1,1-dichloroethylene	3,000 ug/L	240 ug/L	120 ug/L
1,2-dichloroethylene	14 mg/L	1.1 mg/L	100 ug/L (trans)
ethylbenzene	150 ug/L	14 ug/L	68 ug/L
tetrachloroethylene	1.2 mg/L	0.15 mg/L	10 ug/L
toluene	2,000 ug/L	600 ug/L	57 ug/L
1,1,1-trichloroethane	4,900 ug/L	390 ug/L	10,000 ug/L
1,1,2-trichloroethane	19 mg/L	4.4 mg/L	12 ug/L
trichloroethylene	12 mg/L	0.94 mg/L	26 ug/L
xylenes	0.92 mg/L	0.36 mg/L	n/a
4-bromofluorobenzene	n/a	n/a	n/a
n-butylbenzene	(39 ug/L)	(3.1 ug/L)	n/a
sec-butylbenzene	(82 ug/L)	(6.6 ug/L)	n/a
chloroethane	(13 mg/L)	(1 mg/L)	n/a
dibromofluoromethane	n/a	n/a	n/a
1,1-dichloroethane	(20 mg/L)	(2 mg/L)	n/a
1,2-dichlorobenzene	210 ug/L	170 ug/L	1,000 ug/L
1,2-dichloroethane	25 mg/L	4.5 mg/L	0.023 mg/L
1,4-dioxane	(440 mg/L)	(36 mg/L)	n/a
isopropylbenzene	n/a	n/a	n/a
p-isopropyltoluene	(85 ug/L)	(6.8 ug/L)	n/a
4-methyl-2-pentanone	46 mg/L	1.4 mg/L	n/a
naphthalene	510 ug/L	68 ug/L	n/a
n-propylbenzene	(130 ug/L)	(10 ug/L)	n/a
styrene	2.5 mg/L	0.2 mg/L	n/a
trichlorofluoromethane	n/a	n/a	(250 mg/L)
1,2,4-trimethylbenzene	360 ug/L	29 ug/L	n/a
1,3,5-trimethylbenzene	(140 ug/L)	(11 ug/L)	n/a
vinyl chloride	22 mg/L	1.7 mg/L	2.0 ug/L

Sources:
Illinois EPA, Section 302.208 Numeric Standards for Chemical Constituents (https://pcb.illinois.gov/documents/dsweb/Get/Document-33354/)
Illinois EPA Derived Water Quality Criteria (https://www2.illinois.gov/epa/Documents/epa.state.il.us/water/water-quality-standards/water-quality-criteria-list.pdf)
USEPA National Recommended Water Quality Criteria for Human Health (water + organism; https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table)

Notes:
Values enclosed by "( )" were not calculated according to the Illinois EPA regulations due to limited data, these values should only be used for advisory purposes such as establishing "reasonable potential".
mg/L = milligram per liter; ug/L = microgram per liter; n/a = no criterion available